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How to do (CVML) research

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Outline

- Demystify research with four questions
- How to read/write scientific papers?
- General advice about CVML research
- Resources

Demystify research with four questions

- Question One: What is RESEARCH?
  - RESEARCH = RE + SEARCH
  - SEARCH = SE(E) + ARCH(ITECTURE)

Demystify research with four questions

- Question Two: How to classify RESEARCH?
  - By affiliate
    - University: UCB, Stanford, MIT, University of Oxford/Cambridge, QUB
    - Institute: CAS (China), Inria (France), MPI (Germany)
    - (profit / non-profit) Company: Microsoft/Google/Facebook Research, startup company
  - By role
    - (Chair) Professor vs. Principal researcher
    - Assistant/Associate Professor vs. (Senior) Researcher
    - Graduate/undergraduate student vs. Intern

Demystify research with four questions

- Question Three: What are the regular activities of RESEACH?
  - Inputs
    - Reading papers / technical report / blog
    - Participating in conference / seminar
  - Thinking
    - Proposing new idea / research proposal
  - Doing
    - Surveying papers
    - Conducting experiments / simulations
    - Proving theory

Demystify research with four questions

- Question Three: What are the regular activities of RESEACH?
  - Communicating
    - Discussing with supervisors / classmates / colleagues
    - Participating in weekly meeting / paper reading session
  - Outputs
    - Writing weekly/technical reports
    - Writing scientific papers
    - Releasing source code / demos

Demystify research with four questions

- Question Four: How to become a qualified RESEACHER?
  - Understand and remember terminologies and abbreviations in certain field
  - Know classical and state-of-the-art papers in certain field
  - Quickly grasp the key idea in a paper, implement it and find some points for improvement
  - Be able to propose a reasonable research direction by certain evidences, such as paper survey, mathematical formulation, or preliminary experimental results … ...
  - Successfully publish peer-review scientific paper(s)

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How to read/write scientific papers

- Scientific paper is one of the most components/outputs in research
  - Publish or perish
- What is a scientific paper?
  - Novel
  - Self-contained
  - Reproducible
- Compare to other scientific writings
  - Textbook
  - Technical report
  - Weekly report

How to read/write scientific papers

- In essence, scientific paper is used for communication between researchers following some kinds of “protocol”
  - Why
    - Large number of published papers
    - Limited time
    - Reducing the difficulties for understanding and producing

How to read/write scientific papers

- What is the structure of “protocol”?
  - Title / Abstract: read the paper in 2 minutes
  - Introduction: Motivation, background, storyline, overview
  - Related work: base methods, state-of-the-art methods, competitive methods
  - Main content: formulation, system flow chart, implementation details
  - Experimental results: raw results (figure/table), comparison with other methods
  - Conclusion
  - Reference

How to read/write scientific papers

- How to start - “I can't understand most of specific ideas in it”
  - Building essential knowledge structure
  - Cross-referencing papers
  - Reading others’ paper reading notes
  - Reading source code
- The order for paper reading
  - Abstract / Introduction / Related work
  - Main content (without formulation) / Experimental results (good / bad)
  - Main content with formulation and implementation details
  - Project page / source code

How to read/write scientific papers

- After reading paper
  - Paper reading note (demo)
  - Paper reading session
  - Build paper network

How to read/write scientific papers

- The order and source of paper writing
  - Introduction: from new idea proposal
  - Experimental results: raw results from daily log and weekly report; comparison from paper reading
  - Main content: formulation from proposal / weekly discussion; implementation details from daily log and weekly report
  - Related work / Reference: from paper reading
  - Title / Abstract / Conclusion: ideally, the only content you should write before submission deadline

How to read/write scientific papers

- English issue
  - Learning from reading paper
  - Asking professionals for revision
- After paper writing
  - Proofreading, proofreading, proofreading

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General advice about CVML research

- Reading papers / Reproducing others' results from top-tier conferences and journals
- Doing more experiments systematically
- Understanding the results: the reason of (good/bad) results
- Team work

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Resource

- [Slides]: How to write a good CVPR submission. William T. Freeman.
- [Book]: Science Research Writing for Non-Native Speakers of English. Hilary Glasman-Deal.
- [Book]: THE PH.D. GRIND - A Ph.D. Student Memoir. Philip Guo.

Thank you

History

- Version 1.0 [June, 2017]: Initial version for public talks
- Version 1.1 [July, 2017]: Add more explanations for releasing